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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H01J 61/34 — A1

(11) International Publication Number: WO 00/11704

(43) International Publication Date: 2 March 2000 (02.03.00)

(21) International Application Number: PCT/EP99/05769

(22) International Filing Date: 4 August 1999 (04.08.99)

(30) Priority Data:
09/135,863 18 August 1998 (18.08.98) US

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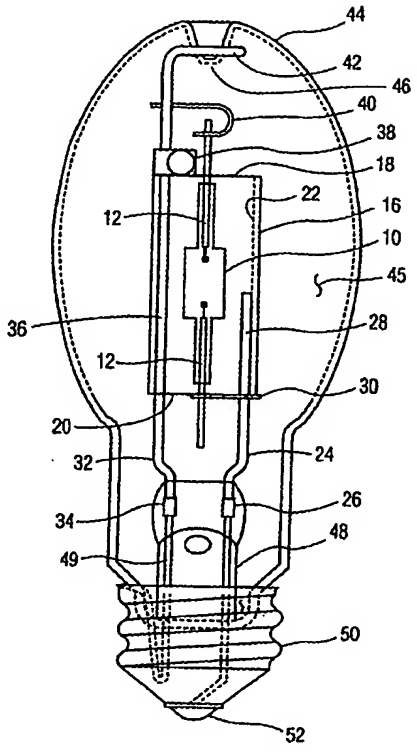
(81) Designated States: CN, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

**Published**
*With international search report.*
*Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.*

(54) Title: LAMP WITH PROTECTIVE SLEEVE

(57) Abstract

In a lamp comprising a light source (10) having a pair of leads (12), there is provided a protective sleeve (16) around the light source. The sleeve has a pair of opposite ends (18, 20). The lamp further comprises a metal frame (24, 32) supporting the sleeve, and a glass envelope (44). According to the invention the metal frame comprises a pair of frame members (28, 36) which are received inside the sleeve. One of the frame members (36) extends through the sleeve.



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# Lamp with protective sleeve.

The invention relates to a lamp having a protective sleeve of quartz surrounding a light source. The light source might for instance be a metal halide arc tube. The light source can also be an incandescent light source, like the source of a halogen lamp.

Protective sleeves of quartz or other transparent material able to withstand operating temperatures are commonly utilized around metal halide arc tubes, also known as high intensity discharge or HID arc tubes, in order to provide protection against non-passive failure during lamp operation. These sleeves act to slow or stop fast moving arc tube fragments and prevent the rupture of the outer lamp envelope. These sleeves may also provide other functions including, but not limited to, reduction of the UV output of the lamp.

These sleeves are typically mounted around the light source using additional straps or clips around the outside or in the ends of the sleeve. In the case of quartz metal halide lamps, any metal supports used in mounting must be kept away from the arc tube or be electrically floating to reduce the rate of sodium loss. An arrangement of this type is disclosed in EP 0 784 334.

Protected mount designs are typically quite expensive and difficult to mechanize. In addition, most mounts are insufficiently rigid and may come apart with rough lamp handling (as during transportation).

According to the invention, a pair of frame members extend up from the stem and through the inside of the sleeve. These frame members are bent so that they are slightly further apart than the inside diameter of the sleeve so that their spring tension will hold the sleeve. The short frame member only needs to extend about ½ way through the sleeve to provide proper support. The sleeve may be kept from sliding up and down on the mount by the terminal connecting the arc tube to the short frame wire (base end) and by the getter (top end).

This design has the unique feature that the entire mount may be assembled easily in an automated fashion in a 2-dimensional plane. After the mount is complete, the sleeve may be slipped over the mount frame wires if they are pinched slightly together. Upon release, the spring tension holds the sleeve firmly in place. Where the long frame wire is

secured in the end of the lamp after sealing, for example engaging the dimple of an ED-type lamp, this mount is extremely secure and is not subject to broken welds or loose clips.

This mount design is in particular suitable for a light source being formed by a ceramic metal halide arc tube. With a ceramic arc tube it is possible to have the electrically charged frame wires relatively close to the arc tube, without raising the danger of rapid sodium loss. Sodium loss is discussed in Carleton et al., "Metal Halide Lamps with Ceramic Envelopes: A Breakthrough in Color Control", Journal of Illuminating Engineering Society, Winter 1997.

While the invention is directed in particular to lamps having an arc tube as the light source, more in particular a ceramic arc tube, it may also find applicability with incandescent light sources such as the IR coated tungsten-halogen lamp disclosed in U.S. Patent No. 5,670,840.

Figure 1 is an elevation of a lamp according to the invention; and

Figure 2 is a diagrammatic view of an alternative embodiment of frame members.

Referring to Figure 1, a lamp according to the invention includes a light source formed by a metal halide arc tube 10 having a pair of opposed leads 12 surrounded by a protective sleeve 16 of quartz. The tubular sleeve 16 has an upper end 18, and oppositely facing lower end 20, and an internal surface 22 extending between the ends.

The quartz sleeve 16 is supported by a short frame member 24 and a long frame member 32, both of which are received inside the sleeve 16 and spring loaded outward against the internal surface 22 thereof. The frame members are preferably formed with stainless steel wire, but MO, NB, or In wire may also be used. The short frame member has a lower end embedded in the stem 48 formed integrally with the glass envelope 44, a straight portion 28 which bears against the internal surface 22, and a welded-on terminal 30. This terminal 30 not only provides an electrical connection to the lower arc tube lead 12, but supports one end 20 of the quartz sleeve 16.

The long frame member 32 has a lower end 34 embedded in the glass stem 48 and a straight section 36 extending through the length of the sleeve 16 and bearing against internal surface 22. A getter 38 fixed to the member 32 bears against the upper end 18 of the

quartz sleeve 16 and serves to fix its position. A terminal 40 provides an electrical connection for the upper arc tube lead 12. Beyond this the frame member 32 is provided with an integrally formed loop 42 which fits around a dimple 46 formed in the upper axial end of the glass envelope 44. This stabilizes the frame members 24, 32, the arc tube 10, and the sleeve 16 inside the glass envelope.

The lower ends 26, 34 of the frame members are welded to leads 49 on which the glass stem 48 is formed. The sleeve 16 is then fitted onto the frame members 24, 32 by sliding onto the upper end thereof without any straps or clips outside of the frame members being necessary. The subassembly is then fitted into the glass envelope 44 with loop 42 about dimple 46. The stem 48 is then sealed to the glass envelope end exhausted, the base 50 is fitted, and the insulated contact 52 is fitted.

Figure 2 shows an alternative arrangement of frame members 60, 70. The short frame member 60 is formed with a lower end 62, a shoulder 64, a bump 66, and a terminal 68. The terminal 68 is welded to lower lead 12 of the arc tube, and the lower end 62 is welded to a lead extending from the stem. The shoulder 64 supports the end 20 of the sleeve 16. The long frame member 70 is formed with the following integral features, in ascending order: a lower end 71, a lower shoulder 72, a straight section 73, a first upper section 74, a retaining loop 75, a second upper section 76, an upper shoulder 77, and a terminal 78. The lower end 71 is welded to a lead embedded in the glass stem. The shoulder 72 (like shoulder 64) supports the bottom end 20 of the arc tube. Straight section 73 extends through the arc tube to a first upper section 74, which slopes toward retaining loop 75. Second upper section 76 slopes outward from loop 75 to upper shoulder 77, which bears against upper end 18 of the quartz sleeve 16. Terminal 78 is welded to the upper lead of the arc tube.

The frame members of Figure 2 are relatively simple to manufacture and afford some advantages during assembly. The converging attitude of the frame sections 74, 76 facilitates slipping the sleeve 16 thereover and guides it toward the shoulder 64, 72. These sections are spring loaded outward so that shoulder 77 snaps into place. Likewise the bump 66 and straight section 73 are spring loaded apart to position the sleeve 16.

The lower ends 62, 71 of the respective frame members 60, 70 are bent at right angles with respect to the frame members and welded to the stem leads 49 outside of the stem 48. This permits a precise positioning of the frame members 60, 70 with respect to each other regardless of the relative positioning of the stem leads. Accordingly close tolerances during the forming of the stem need not be maintained.

Details of the glass envelope and electrical connections in Figure 2 are the same as in Figure 1.

CLAIMS:

1. A lamp comprising a light source (10) having a pair of leads (12), a protective sleeve (16) around the light source, said sleeve (16) having a pair of opposed ends (18, 20), a metal frame supporting said sleeve (16), and a glass envelope (44), characterized in that said frame comprises a pair of frame members (24, 32) received inside said protective sleeve (16), one of said frame members (32) extending through said sleeve (16).

2. A lamp as in claim 1 wherein said frame members (24, 32) have respective portions (28, 36) which are substantially parallel inside of said protective sleeve (16).

3. A lamp as in claim 1 or 2 wherein said frame members (24, 32) are spring loaded outward against said protective sleeve (16).

4. A lamp as in claim 1, 2 or 3wherein said light source (10) is a metal halide arc tube.

5. A lamp as in claim 4 wherein said arc tube (10) comprises an ceramic envelope and a metal halide filling.

6. A lamp as in claim 1,2, 3, 4 or 5 further comprising a pair of terminals (30, 40) connected to said leads of said light source (10), said terminals (30, 40) being fixed to said frame members (24, 32) and one of said terminals (30) extends laterally of the respective said frame member (24) and bears against an end (20) of said protective sleeve (16).

7. A lamp as in claim 1, 2, 3, 4 or 5 further comprising a getter (38) fixed to one of said frame members (32), said getter (38) bearing against one of said ends (18) of said protective sleeve (16).

8. A lamp as in any preceding claims wherein said envelope (44) has a top end with an internal dimple (40), said one of said frame members (32) extending through said

protective sleeve (16) having retention means (42) integral therewith for cooperating with said dimple (46) to fix the position of said one of said frame members (32) with respect to said envelope (44).

9. A lamp as in any preceding claims wherein said frame members comprise a long frame member (32) which extends through said protective sleeve (16) and a short frame member (24) which extends only partially into said protective sleeve (16).

10. A lamp as in claim 9 wherein at least one of said frame members (60, 70) is formed with an integral shoulder (64, 77) which bears against one of said ends (20) of said protective sleeve.

11. A lamp as in any preceding claims wherein said long frame member (70) is formed with a pair of shoulders (72, 77), each said shoulder bearing against a respective end (20, 18) of said sleeve (16) to position said sleeve (16) with respect to said long frame member (70).

12. A lamp as in any preceding claim wherein at least one of said frame members (60, 70) is formed with an integral terminal (68, 78) which is connected to a respective said electrode (12).

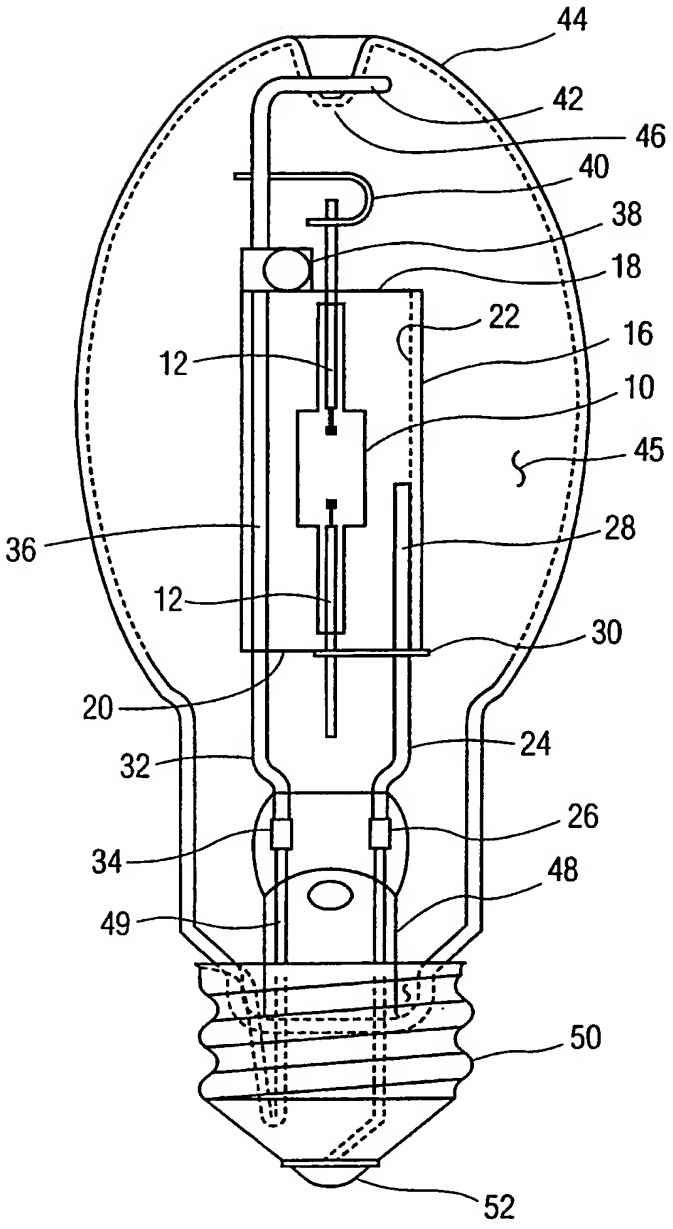


FIG. 1

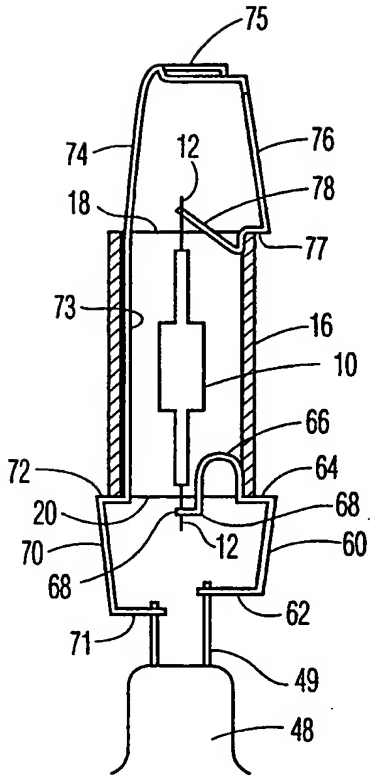


FIG. 2

# INTERNATIONAL SEARCH REPORT

Inter ›nal Application No
PCT/EP 99/05769

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01J61/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | PATENT ABSTRACTS OF JAPAN<br>vol. 018, no. 324 (E-1564),<br>20 June 1994 (1994-06-20)<br>& JP 06 076799 A (HITACHI LTD),<br>18 March 1994 (1994-03-18)<br>abstract | 1 |
| A | US 5 594 294 A (DUFFY GERALD E ET AL)<br>14 January 1997 (1997-01-14)<br>abstract<br>column 1, line 36 -column 2, line 65;<br>figures 1,2 | 1,4 |
| A | EP 0 784 334 A (OSRAM SYLVANIA INC)<br>16 July 1997 (1997-07-16)<br>cited in the application | |

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Information on patent family members

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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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